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Pisidium taraguyense and *Pisidium pipoense,* New Species from Northeastern Argentina (Bivalvia: Sphaeriidae)

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Abstract. *Pisidium* ***taraguyense*** sp. nov., from Corrientes province, and *Pisidium* ***pipoense*** sp. nov., from Misiones province, northeastern Argentina, are described. *Pisidium* ***taraguyense*** sp. nov. is characterized by a definite ovate shell outline, markedly inequilateral shell, quite inflated, with beaks full, ligament tending to be external, hardly visible from the exterior, and never protruding. *Pisidium* ***pipoense*** sp. nov. is characterized by a subquadrangular shell outline, with inflated and centrally located beaks, ligament tending to be external, visible from the exterior, but not protruding. In both species, the roof of the ligament-pit is a very thin wall formed by a series of small calcic plates that partially hide the ligament, which is exposed (only at its anterior half) through a narrow line.

INTRODUCTION

Little is known about the species of *Pisidium* Pfeiffer, 1821, distributed in Misiones and Corrientes provinces (Figure 1), a geographical area characterized from a faunistic viewpoint by the high degree of local and regional endemism evidenced by several freshwater mollusks e.g., the monospecific genus *Acrorbis* Odhner, 1937 (Basommatophora: Planorbidae) (Paraense, 1986); one species of *Chilina* Gray, 1828 (Basommatophora: Chilinidae) (Hylton Scott, 1958); one species of *Pomacea* Perry, 1810 (Mesogastropoda: Ampullariidae) (Ihering, 1919), and two species of *Eupera* Bourguignat, 1854 (Bivalvia: Sphaeriidae) (Ituarte, 1989; Ituarte & Mansur, 1993).

Knowledge of the taxonomy of the genus *Pisidium* in southern South America is also rather scarce, and it mainly comes from works of d'Orbigny (1835, 1846); Pilsbry (1897, 1911); Meier-Brook (1967); Kuiper & Hinz (1984); Ituarte & Gordillo (1991); and Ituarte (1995, 1996).

In the present paper, the presence of the genus *Pisidium* in Misiones and Corrientes provinces is reported for the first time, and two new species, *Pisidium* ***pipoense*** and *Pisidium* ***taraguyense,*** are also described.

MATERIALS AND METHODS

Samples upon which the present study was based are part of the malacological collection of the Department of Invertebrate Zoology, Museo de La Plata (MLP). Additional samples were taken by the author during the years 1987, 1991, and 1997, now lodged in the same institution. Paratypes of *Pisidium forense* Meier-Brook, 1967 (from Senckenberg Museum, Frankfurt [SMF]) were studied for comparative purposes. Length measurements (shell length [SL], shell height [SH], shell width [SW], and pre-siphonal suture length [PSS]), shape indices and morphometric ratios (height index [I SH/SL], convexity index [Ci = SW/SH], and hinge length : shell length ratio [HiL/SL]), were calculated according to the criteria followed by Ituarte (1996).

SYSTEMATICS

Pisidium ***taraguyense*** Ituarte, sp. nov.

(Figures 2–10)

Diagnosis: Medium-sized species characterized by ovate shell, rather inequilateral, with anterior end produced, quite inflated with full beaks. Ligament tending to be external but hardly visible from the exterior, never protruding.

Description: Species medium-sized (maximum SL = 4.1 mm), quite inflated (average Ci = 84.09 ± 3.6), rather inequilateral. Beaks full, wide, well visible above dorsal margin, backwardly displaced (located at about 62% of shell length). Shell outline sharply ovate, sometimes tending to be elliptical; however, due to prominent beaks above dorsal margin, height index (shell height/shell length) does not reflect actual appearance of shell outline (average I SH/SL = 84.1 ± 2.53). Dorsal margin markedly shorter than ventral one, very slightly concave at midst, anterior half straight, posterior one evenly curved. Anterior margin projecting in sharp curve, posterior margin rounded, somewhat truncated. Well-marked angle between dorsal and anterior margin. Ventral margin wide, evenly curved, somewhat straight in cases. Shell surface dull, light yellowish brown color, rather regularly and finely striated (more than 40 striae per mm).

Hinge plate quite narrow, left inner (C_2) and right (C_3) cardinal teeth hanging from inner hinge margin. Hinge line markedly curved, rather long (HiL/SL = 51.6 ± 1.6).

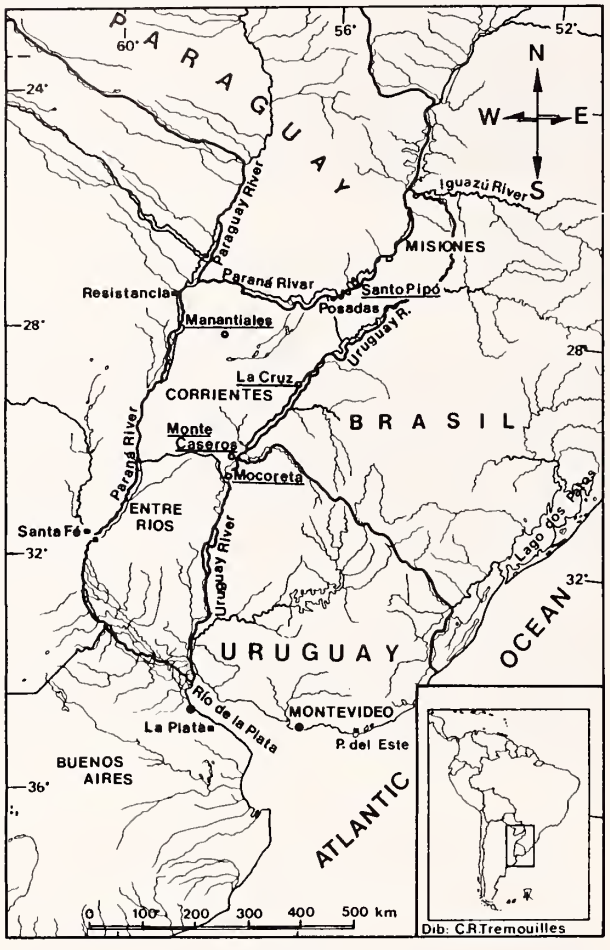
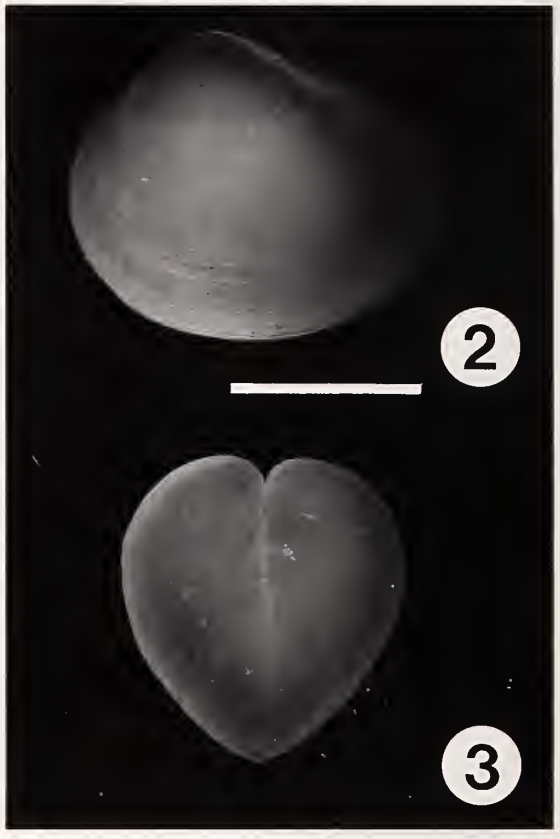


Figure 1

Location map.



Figures 2 and 3

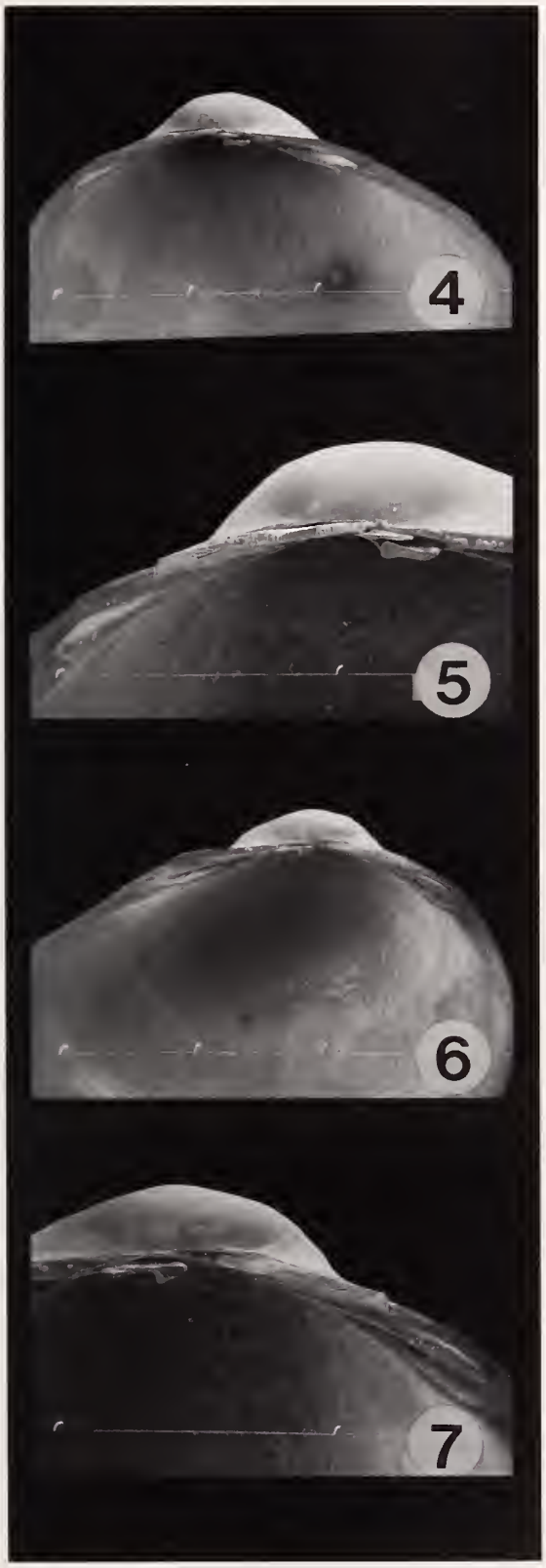
Pisidium ***taraguyense*** Ituarte, sp. nov. (MLP 5318). Figure 2. Right external view. Figure 3. Posterior view of a shell. Scale bar (same scale bar for both figures) = 2 mm.

In left valve, two delicate cardinal teeth, the internal (C_2) very slightly sinuous, upward directed at posterior end; external cardinal tooth (C_4) slender, nearly straight, slightly oblique, located just below central point of beak, overlapping C_2 at its posterior half or slightly more. Anterior lateral tooth (A_{II}) close to cardinals, strong, triangular cusp displaced forward. Posterior lateral tooth (P_{II}) short, robust, with distally displaced cusp. Right valve: a delicate cardinal tooth (C_3), extremely slender at anterior half; straight, enlarged at posterior end, forming triangular, weakly sulcated small head. Anterior lateral teeth well developed, inner (A_I) with distal cusp, outer (A_{III}) a minuscule short triangular cusp; outer posterior lateral tooth (P_{III}) short, triangular, low, with nearly central cusp, inner one (P_I) with distally displaced triangular cusp. Divergence angle between laterals about 130°.

Ligament slightly tending to be external, not protruding, hardly discernible from exterior. Ligament-pit long, low, and slender (representing about 23% of shell length); partially closed dorsally by very thin calcareous wall, actually formed by several (four to six) small plates (easily detachable in dried specimens); then, ligament visible from exterior only from a narrow line.

Anatomy: Only one siphonal aperture, the anal. Pre-siphonal suture length about 15% of shell length, nearly equal to diameter of anal aperture. Only inner demibranchs present. Brood pouches arising from upper and posterior part of demibranchs.

Remarks: *Pisidium* ***taraguyense*** differs from the remaining Argentinian *Pisidium* species in being decidedly ovate, or elliptical, in shell outline, strikingly inequilateral, and quite globose. It shares with *Pisidium sterkianum* Pilsbry, 1897, and *Pisidium vile* Pilsbry, 1897 (both species distributed along the Paraná, Río de la Plata and Uruguay basins) the presence of only one siphonal aperture and only one, the inner, demibranch as common features. The external ligament is also a common characteristic; however, in *Pisidium* ***taraguyense*** it is not as extroverted as in *P. sterkianum*. The same type of small extroverted external ligament has also been observed in *Pisidium* ***pi-***



poense (present study), and in the studied paratypes of *Pisidium forense* Meier-Brook, 1967 (SMF 186492/c and 186492/h) from Juiz de Fora, Minas Gerais, Brazil. Meier-Brook (1967) reported that in some paratypes of *P. forense* the ligament seems to be completely enclosed.

Type locality: La Cruz (29°10′S, 56°38′W), San Martín department, Corrientes Province, Argentina.

Distribution: Known only from Corrientes Province, besides the type locality, at Mocoretá (unnamed brook) (30°28′S, 58°04′W) (MLP 5347), Monte Caseros department, and Manantiales (27°56′S, 58°06′W) (MLP 5317), Mburucuyá department (Figure 1).

Type specimens: Holotype: in the collection of the Department of Invertebrate Zoology, Museo de La Plata (MLP 5318); paratypes: MLP 5318; Division of Invertebrates, Museo Argentino de Ciencias Naturales (2 paratypes MACN 34120); Muséum National d'Histoire Naturélle (Paris) (3 paratypes).

Etymology: The specific name derives from Taraguy (or Taragüi), the aboriginal name given by the Guaraní Indian people to Corrientes city. The meaning of the name was later extended by usage to designate the whole territory that presently corresponds to Corrientes Province, where the type specimens were collected; it was part of the vast ancient territory occupied by the Guaraní tribes.

Pisidium ***pipoense*** Ituarte, sp. nov.

(Figures 11–19)

Diagnosis: Shell rather solid, small or medium-sized, inflated, beaks nearly central. The subquadrangular shell outline is the distinctive character. Ligament slightly tending to be external, visible from the exterior but not protruding.

Description: Shell small to medium (maximum SL = 3.9 mm), rather solid, inflated (average CI = 74.19 ± 5.44), nearly equilateral. Shell outline sub-quadrangular, high (average I SH/SL = 89.2 ± 1.68), dorsal margin slightly shorter than ventral margin. Anterior half of dorsal margin straight, posterior half, slightly convex. Ventral margin evenly curved. Anterior end moderately produced, posterior end truncated. Beaks full, nearly central (located at about 58% of shell length), well projecting above dorsal margin, slightly opistogyrous. Nepionic shell usually

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Figures 4–7

Pisidium ***taraguyense*** Ituarte, sp. nov. (MLP 5318). Figure 4. Hinge of the left valve. Figure 5. Detail of left cardinal teeth, ligament, and posterior lateral tooth. Figure 6. Hinge of the right valve. Figure 7. Detail of right cardinal tooth, ligament, and posterior lateral teeth. Scale bars = 1 mm.

Figures 8–10

Pisidium ***taraguyense*** Ituarte, sp. nov. (MLP 5318). Figure 8. Lateral view of the ligament position and dorsal wall (arrow) of the ligament-pit. Figure 9. Postero-dorsal view of the escutcheon, showing the calcic plates forming the roof of the ligament-pit, and the narrow part of the ligament exposed (arrow). Figure 10. Dorsal view of the escutcheon, showing the space left by the lack of two or three plates detached during the processing of the specimen for SEM (arrow). Scale bars: Figure 8–9 = 1 mm; Figure 10 = 200 μm.

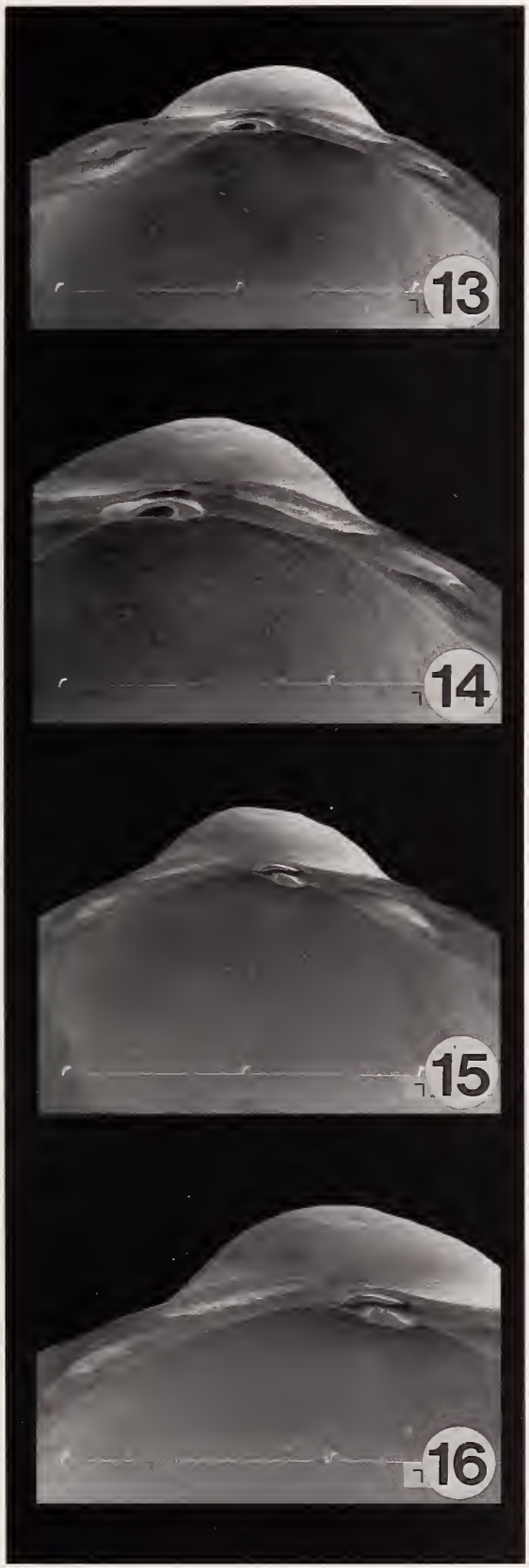
Figures 11 and 12

Pisidium ***pipoense*** Ituarte, sp. nov. (MLP 5336). Figure 11. Right external view. Figure 12. Posterior view of a shell. Scale bar (same scale bar for both figures) = 1 mm.

marked, forming a cap. Surface finely and regularly striated (about 30–40 striae per mm).

Hinge plate somewhat solid. Hinge line long (HiL/SL = 52 ± 2.1). In right valve, a single, somewhat weak cardinal tooth (C_3), slender, low, faintly curved, enlarged at posterior end, forming a slightly sulcated cup. Anterior right lateral teeth well developed, the outer (A_{III}) small, cusp slightly displaced forward, the inner (A_I) robust, cusp central. Outer posterior lateral tooth (P_{III}) reduced in size, cusp distal, forwardly displaced with respect to P_I. P_I strong, cusp triangular, central. In left valve, two well-developed cardinal teeth. Inner cardinal tooth (C_2) short, somewhat bent upward at distal end, located before central point of beak. Outer left cardinal (C_4) long, slender, slightly arcuate, parallel with respect to antero-posterior axis, overlapping C_2 at nearly its entire length. Anterior (A_{II}) and posterior (P_{II}) lateral teeth strong, both arising from robust bases, cusps high, triangular, distally displaced in A_{II} and nearly central in P_{II}. Divergence angle between laterals varies from 115° to 120°.

Ligament visible from exterior only as narrow line, never protruding. Ligament-pit slender and long, surpass-



ing (sometimes largely) the interception line of beak with dorsal margin (ligament length about 21% of shell length). Dorsally, ligament-pit delimited by very thin calcareous wall. In dried specimens it breaks, usually into a series of four to six small delicate, parallelogram-shaped calcic plates. This thin wall almost closes completely ligament-pit, determining when valves are joined; only a very narrow space remains, from which ligament is exposed to exterior.

Anatomy: Only anal aperture present. Pre-siphonal suture long, representing about 20% of shell length, and 1.6 of diameter of siphonal aperture (average 1.55 ± 0.31). Only inner demibranch present; brood pouch develops from upper part of inner wall of descendent lamella. Five well-marked muscle scars, corresponding to inner radial mantle muscles, located far from pallial line.

Remarks: *Pisidium* ***pipoense*** may be easily distinguished from other South American *Pisidium* species by its general external shape and subquadrangular shell outline. *P.* ***pipoense*** is similar to *Pisidium forense* Meier-Brook, 1967, but is distinguished by its smaller maximum size, slightly lower and flatter shell, sharp quadrangular shell shape, and stronger hinge plate. The more central position of the beaks and the shape and relative length, slightly longer, of the ligament are also distinctive features. The shell surface striation is more marked, fine, and regularly spaced in *P. forense* than in *P.* ***pipoense.*** Beaks are fuller in *P. forense,* and the presiphonal suture is longer than in *P.* ***pipoense.*** In ***P. pipoense*** the position of the ligament, tending slightly to be external (never protruding), the presence of only one siphonal aperture and one (the external) demibranch, and the type of development of marsupial sacs (arising upwardly and posteriorly in inner demibranchs) resemble species belonging to the "eastern Brazilian" and "Parano-Platense" drainages (Figure 1) (i.e., *Pisidium sterkianum* and *Pisidium vile* from Uruguay and Argentina, and *Pisidium forense* from Brazil). However, the presence of a thin wall partially closing the roof of the ligament-pit, as was observed in *P. forense* and *P.* ***taraguyense,*** and the somewhat solid hinge plate are substantial differences with respect to the only Argentine species known to have external ligaments: *P. sterkianum.*

Type locality: A small creek that flows into the Santo Pipó Brook (27°07′S, 55°24′W), on the intersection with

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Figures 13–16

Pisidium ***pipoense*** Ituarte, sp. nov. (MLP 5336). Figure 13. Hinge of the right valve. Figure 14. Detail of right cardinal tooth, ligament, and posterior lateral teeth. Figure 15. Hinge of the left valve. Figure 16. Detail of left cardinal teeth, ligament, and posterior lateral tooth. Scale bars = 1 mm.

Figures 17–19

Pisidium ***pipoense*** Ituarte, sp. nov. (MLP 5336). Figure 17. Lateral view of the ligament position and dorsal wall (arrow) of the ligament-pit. Figure 18. Latero-dorsal view of the escutcheon showing the calcic plates forming the roof of the ligament-pit (arrow). Figure 19. Dorsal view of the escutcheon, showing the narrow exposed area of the ligament (arrow). Scale bars = 100 μm.

the national route No. 12, Santo Pipó, department of San Ignacio, Misiones, Argentina.

Distribution: Known only from the type locality.

Type specimens: Holotype: in the collection of the Department of Invertebrate Zoology, Museo de La Plata (MLP 5336); paratypes: MLP 5298 and 5336; Division of Invertebrates, Museo Argentino de Cienciïas Naturales (2 paratypes MACN34119); Muséum National d'Histoire Naturélle (Paris) (3 paratypes).

Etymology: The specific name refers to the type locality, Santo Pipó.

GENERAL REMARKS

Our limited knowledge of the specific diversity and morphological variability of the sphaeriid fauna from South America precludes us from proposing natural supraspecific groups for *Pisidium* species distributed in the Neotropical Region. However, new data available from the descriptions of *Pisidium* ***taraguyense*** and *Pisidium* ***pipoense*** allow us to envisage at least a preliminary biogeographical sketch for a restricted geographical area in eastern South America, within which seems to arise a somewhat clearly defined group of species distributed along the drainages of southeastern Brazil, western Uruguay, and northeastern Argentina, with a provisional southern limit in the Río de la Plata River (Figure 1) (i.e., the southern limit of the known geographical distribution of *P. vile* and *P. sterkianum* (Ituarte, 1996). This group of species includes *P. sterkianum, P. vile, P. forense, P.* ***taraguyense,*** and *P.* ***pipoense.*** The morphological basis for this group, still incomplete, includes the possession of a fragile shell, a rather weak hinge plate, only one demibranch and siphonal opening, as well as any sort of external ligament, ranging from a true external ligament, as in *P. sterkianum,* to an external ligament partially hidden by the development of the dorsal wall of the ligament-pit and never protruded as in *P. forense, P.* ***taraguyense,*** and *P.* ***pipoense.*** The species included in this group seem to differ consistently from those species distributed in southern Chile and Patagonia (Argentine territories south to the Colorado River), which have more solid shells and hinge plates, an internal ligament and, in some, two demibranchs and two siphonal apertures (Pilsbry, 1911; Ituarte, 1996).

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